Largemouth Bass

Micropterus salmoides

DESCRIPTION

The largemouth bass is one of the most important freshwater game fishes in the United States. It is considered a warm water fish and is the largest member of the sunfish family (Centrarchidae). The largemouth is able to thrive in a wide range of freshwater habitats, however, it thrives best in shallow, weedy lakes, sluggish rivers or backwaters. Both the largemouth and smallmouth bass are similar in appearance. The largemouth can be distinguished by its longer upper jaw which, when the mouth is closed, extends well beyond the eye. The body is oblong and somewhat compressed. It is dark green above, shading to lighter silvery-green on the sides, and whitish below (Scarola 1987). A solid, dark horizontal stripe extending from the head to the tail further distinguishes it from the smallmouth bass.

BODY SIZE

Largemouth bass average 10 – 20 inches in length. A typical adult is 1 – 2 pounds, but 5 – 13 pounds is not uncommon (Cochran 1960). Mature females grow larger than males, growing up to 10 pounds; the males seldom exceed 5 pounds (Davis and Lock 1997).

In the Primary Study Area: During the 2000 fish biomass survey in the primary study area, 343 largemouth bass were captured from reaches 5A, 5B, 5C, Woods Pond, and its associated backwaters. Table 1 shows the captures for each reach by size class. The length of largemouth bass captured ranged from 36 to 476 mm with a mean of 234.9 mm (SD = 126.7). The weights ranged from 1.0 to 1245 g with a mean of 376.2 g (SD = 361.8).

DISTRIBUTION

The largemouth bass is indigenous to southeastern Canada and much of the eastern United States (Figure 1). This species was introduced west of the Rockies and into New England in the mid 1800s (McClane 1978). Largemouth bass were first introduced into Massachusetts prior to 1862 (Hartel *et al*. 1996). As a widely introduced fish that adapts well to warm waters, it has become a highly valued game fish now found throughout the United States.

Figure 1. Indigenous range of largemouth bass in North America

Table 1. Largemouth bass captures from the primary study area in 2000

Reach	Size Class					Total
	YOY	I	II	III	IV	
5A	0	4	14	23	11	52
5B	0	17	12	16	26	71
5C	3	27	15	31	34	110
Backwaters	1	20	1	5	8	35
Woods Pond	5	40	7	13	10	75
Total	9	108	49	88	89	343

Size classes (mm): YOY (Young of the Year)=<50, I =50-150, II = 150-250, III = 250-350, IV = 350+

MIGRATION

Largemouth bass do not migrate seasonally or to breed. Studies have found that largemouth bass tend to move toward warmer water in the colder months, although this may be affected by prey availability (Davis and Lock 1997).

HABITAT

Largemouth bass are found in ponds, lakes, and slow, sluggish streams. Lakes are the preferred habitat. Optimal conditions include extensive shallow areas (<6 m depth) that support submergent vegetation as well as areas deep enough (3 – 15 m mean depth) to successfully overwinter bass (Robbins and MacCrimmon 1974, Carlander 1977, Winter 1977 as cited in Stuber *et al*. 1982). They tend to move less frequently when the water temperatures drop below 10ºC or rises above 27ºC.

Largemouth bass are most commonly found around submerged logs and rocks concealed from their prey. Typically the species does not do well in muddy areas because they often feed by sight, and require water clarity of at least 15 inches, preferably 24 inches (Davis and Lock 1997). In riverine habitats largemouth bass prefer low gradient (1 m/km) streams, large, slow moving rivers or pools of streams with soft bottoms, some aquatic vegetation, and clear water (Finnell *et al*. 1956, Trautman 1957, Larimore and Smith 1963, Scott and Crossman 1973, Moyle and Nichols 1973 as cited in Stuber *et al*. 1982). Largemouth bass are considered intolerant of suspended solids (turbidity) and sediment (Muncy *et al*. 1979 as cited in Stuber *et al*. 1982). Optimum suspended solid levels are assumed to be 5 – 25 ppm, and levels <5 ppm indicate low productivity (Buck 1956a, 1956b as cited in Stuber *et al*. 1982). Largemouth bass require a pH between 5 and 10 for successful reproduction (Swingle 1956, Buck and Thoits 1970 as cited in Stuber *et al*. 1982).

In the Study Area: Largemouth bass were primarily observed in the warm shallow submerged aquatic habitat and deep-water habitat of Woods Pond. Largemouth were observed in the slow gradient portions of the mainstem (Table 2).

Table 2. Habitat use by largemouth bass in the primary study area

Habitat Codes and Natural Community Classifications																				
Wetland Habitats													Terrestrial Habitats							
ROW	ROW & PAB	SHO		PFO				PSS	PEM		WM	VP	SW	MW	HW			OF	AGR	RES
Medium-gradient stream	Low-gradient stream	Riverin pointbar and beach	Mud flat	Red maple swamp	Black ash-red maple-tamarack calcareous seepage swamp	Transitional floodplain forest	High-terrace floodplain forest	Shrub swamp	Deep emergent marsh	Shallow emergent marsh	Wet meadow	Woodland vernal pool	Spruce-fir-northern hardwood forest	Northern hardwoods-hemlock-white pine forest	Successional northern hardwood forest	Red oak-sugar maple transitional forest	Rich mesic forest	Cultural grassland	Agricultural cropland	Residential development
	Y																			

ROW = Riverine Open Water
SHO = Shorelines
PFO = Palustrine Forested
PSS = Palustrine Scrub-Shrub
PEM = Palustrine Emergent
WM = Wet Meadow
PAB = Palustrine Aquatic Bed
VP = Vernal Pool
SW = Softwood Forests
MW = Mixed Forests
HW = Hardwood Forests
OF = Open Fields
AGR = Agricultural Croplands
RES = Residential

Season of Use
B = Breeding
M = Migration
W = Wintering
Y = Year-round
Shading = observed in study area

HIBERNATION

Largemouth bass do not hibernate, but they tend to enter periods of inactivity when the water temperatures drop below 10ºC. They will seek deeper water during the winter and take shelter at the bottom. The largemouth bass will remain more active than the smallmouth bass and is sometimes taken through the ice (Scarola 1973).

HOME RANGE AND TERRITORIALITY

Largemouth bass appear to maintain a foraging territory (Snow 1961 as cited in Carlander 1977). They are aggressively territorial during breeding season when the male will guard the nest until the eggs hatch and the fry disperse (approximately a two-week period depending on temperatures).

BREEDING

Largemouth bass typically first spawn when they are one year old and approximately 10 inches long. Spawning takes place in the late spring at water temperatures of 18° – 23° C in depths of 1 – 4 ft, anywhere from 1 – 8 ft off shore. Nests have been observed at depths of 20 ft in clear water (Davis and Lock, 1997).

Males build nests by fanning areas on substrates such as sand, gravel, roots, or aquatic vegetation close to the cover of logs, rocks or vegetation (Kramer and Smith 1962, Emig 1966, Breder 1936 as cited in Carlander 1977). Largemouth will not nest on silt bottoms (Robinson 1961 as cited in Carlander 1977). The female will generally lay only a few hundred eggs at a time. The eggs are adhesive and fasten to the bottom of the nest. During the spawning period, a female may mate with several males in different nests, and thus several batches of eggs are deposited into the nests at short intervals (Reighard 1906, Breder and Rosen 1966). Female largemouth bass may contain 2,000 – 94,000 or more eggs (Moyle 1976). The fecundity appears to increase with age, weight, and length of the female fish (Latta 1975). The male will guard the nest and fan the silt away from the eggs. He will stand guard until the fry disperse, which may be a period of two weeks or more, depending on temperatures. If the temperature drops below 15°C the male will abandon the nest (Davis and Locke 1997).

In the Study Area: Although no pairs of largemouth bass were observed spawning in the primary study area, the capture data for the Young of the Year (Table 1) suggests that the primary juvenile habitat is located in the warm, shallow waters that contain submerged aquatics.

GROWTH AND DEVELOPMENT

Eggs are spherical and between 1.5 – 1.7 mm in diameter (Kelley 1962). Eggs hatch between 2 – 10 days on average, depending on temperatures. Hatching was reported as requiring 16 – 21 days in one Wisconsin study (Mraz 1957 as cited in Carlander 1977). Larvae are 3.6 – 4.1 mm at the time of hatching (Wang and Kernehan 1979). Newly hatched larvae have no pigmentation and remain on the nest until the yolk sac has been absorbed, after which they school, frequenting the shallow water (Carr 1942). They remain in schools until over 250 mm in length, a characteristic that distinguishes them from the smallmouth species, which scatters at only 125 mm in length (McClane 1978).

Fry develop mouthparts in 190 hours if the temperature is conducive (i.e., 20°C) and begin feeding on zooplankton at about 8 days old. They add insect larvae and fish to their diet when they reach approximately 50 mm (McClane 1978, Davis and Lock 1997). At this stage the largemouth fry are a yellowish, transparent color with a very pronounced black stripe down the body. Table 3 illustrates the mean total length for experimental groups of young-of-the-year (YOY) largemouth bass in Minnesota (Kramer, R.H. and L.L. Smith, Jr., 1960 as site in Carlander 1977). Optimal temperature for growth of adult bass ranges from 24 – 30°C (Mohler 1966, Coutant 1975, Brungs and Jones 1977, Carlander 1977 as cited in Stuber *et al*. 1982). Very little growth occurs below 15°C (Mohler 1966, as cited in Stuber *et al*. 1982) or above 36°C (Carlander 1977 as cited in Stuber *et al*. 1982). Salinity levels above 4 ppt cause sharp declines in abundance (Tebo and McCoy 1964 as cited in Stuber *et al*. 1982).

Table 3. The mean TL (Total Length) of various experimental groups

2 weeks	8-17 mm	10 weeks	43-60 mm
4 weeks	16-36 mm	12 weeks	51-68 mm
6 weeks	26-45 mm	14 weeks	54-75 mm
8 weeks	34-54 mm	16 weeks	55-81 mm

In general, growth is slower in the north and more rapid in the south, which is believed to be related to the length of the growing season. Largemouth bass are also longer-lived in the north than in the south (Bennett 1937).

FOOD HABITS AND DIET

The largemouth bass is a true predator, beginning to feed on their life long diet of reptiles, amphibians, and fish at just 51 mm long. Largemouth bass fry feed mainly on microcrustaceans and small insects, juveniles consume mostly insects and small fish, and adults feed primarily on fish and crayfish (Emig 1966, Zweiacker and Summerfelt 1974, Carlander 1977 as cited in Stuber *et al.*, 1982).

Largemouth bass swallow live fish and other aquatic life whole rather than biting off chunks, which limits the size of what they can eat. One of the reasons that bass feed is to satisfy hunger; the other is an apparent reflex action to sound or vibrations in the water. Normally, fry feed about every three hours, as this is the length of time necessary for food to pass through the gut. Adult largemouth bass are often observed to feed every 14 – 24 hours depending on the size of the prey devoured (Davis and Lock 1997). Largemouth bass feeding intensity is bimodal, with peaks in the early morning and late evening (Snow 1971, Olmstead 1974 as cited in Stuber 1982).

Cessation of feeding in the spring appears to be associated with a stage in sexual development (Lewis *et al.* 1961). Dieoff of the heavy growth of submerged aquatic plants in August in a small Illinois lake was followed by rapid growth of the largemouth bass, which could then readily feed on the smaller fish that had hidden in the plant growth (Bennett 1971 as cited in Carlander 1978). A study conducted at Michigan State University demonstrated that prey encounter rates and handling times and swimming velocities of the largemouth bass while searching for and handling prey were significantly influenced by changes in vegetation (Anderson 1984 as cited in Carlander 1978). Average growth of bass is often related to the abundance of vulnerable prey (Lewis 1967 as cited in Carlander 1978).

ENERGETICS AND METABOLISM

Largemouth bass consumes 10 times their body weight per year (FishBase 2001). Growth of largemouth bass is reduced at dissolved oxygen levels <8 mg/l, and a substantial reduction occurs below 4 mg/l (Stewart *et al.* 1967 as cited in Stuber *et al.* 1982). Levels below 1.0 mg/l are considered lethal (Moss and Scott 1961, Mohler 1966, Petit 1973 as cited in Stuber *et al.* 1982). In one study, the minimal oxygen concentrations that bass can tolerate in a sudden change were 0.92, 1.19 and 1.40 ppm at 25°, 30°, and 35°C; however, when acclimated, these values were 0.78 – 0.87, 0.79 – 0.87 and 1.20 – 1.32 ppm (Moss and Scott 1961 as cited in Carlander 1977).

POPULATIONS AND DEMOGRAPHY

Survivorship: Largemouth bass survivorship is variable, depending on fishing pressure, temperature, and prey and predator densities. Survivorship can be as high as 62% per year (FishBase 2001).

Age at Maturity and Life Span: Largemouth bass reach sexual maturity as early as age 1 near the southern limit of their range (Morgan 1958, Clugston 1964, La Faunce *et al.* 1964, Smitherman 1975 as cited in Stuber *et al.* 1982). Maturity is delayed among more northern populations (Eipper and Regier 1962, Bennett 1971, Carander 1977 as cited in Stuber *et al.* 1982). In Canada, maturity is reached in 3 – 4 years for males and 4 – 5 years for females (Scott and Crossman 1973 as cited in Stuber *et al.* 1982). The average life span appears to be 11 years (Scott and Crossman 1973).

Mortality: Predation, competition, food availability, parasites and disease all play a part in largemouth bass mortality. Mortality is typically high for YOY

and is dependent upon spawning time, density of adult and juvenile bass population, availability of prey, temperature, and overwinter dieoff (Post *et al*. 1998).

Enemies: Snapping turtles, water snakes, belted kingfishers, great blue herons, and bitterns are known to prey upon largemouth bass (Scott and Crossman 1973). The largemouth bass is one of the most popular gamefishes in the Untied States, and they are actively sought by anglers.

STATUS

General: The largemouth bass has been introduced widely as a gamefish and is now cosmopolitan. Provided that conditions are suitable, local populations can be abundant. Several countries have reported ecological impact after introduction. Largemouth bass introduced into Lake Atitlan, Guatemala, are believed to be responsible for elimination of several native species of fish, reduction in total biomass of fish, predation on young flightless giant grebes, and competition for the insects and crustaceans eaten by the grebes (LaBastille 1974 as cited by Carlander 1977).

In The Study Area: Based on biomass surveys in the primary study area, it is estimated that largemouth bass are common in suitable habitats. Figure 2 illustrates the locations where largemouth bass were observed during the 1998–2000 field surveys.

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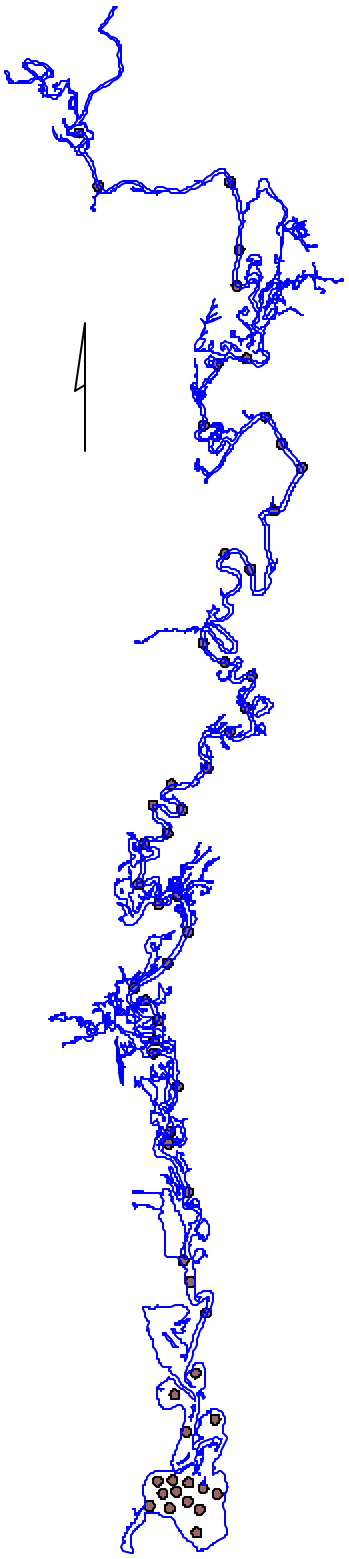

Figure 2. Largemouth bass observations in the primary study area from 1998 – 2000 field studies

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